A compact, low power pulsed optical communication system for spacecraft

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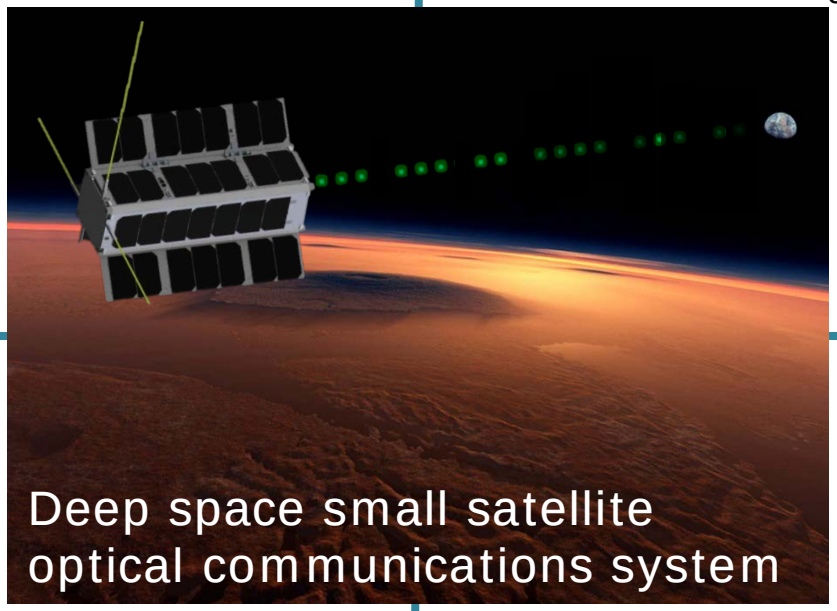
- **Two additional doctoral students**

Research Objectives

- **Develop a 5 W, 2 kg, up to 100 Mbps optical communication system from TRL 1 to TRL 3.**
- **FPGA-based Differential Pulse Position Modulator**
  - Sub-nanosecond slot width
  - Long symbol length
    → low average power, high peak power
- **Low power Master Oscillator Power Fiber Amplifier laser system**
  - ~ 200 psec, 1550 nm
    > kW peak power
- **Compact structure, thermal management**



Approach

- **System level design:**
  - Required timing accuracy, laser power, slot width
- **Chip Scale Atomic Clock driven Delay Locked Loop to produce precise delays**
- **Optimization of peak optical power vs. average pump power for MOPFA system**
- **Laboratory testing of prototype FPGA modulator, MOPFA laser system, and compact instrument structure**
  - Delay time accuracy, average versus peak power, and beam quality

Potential Impact

- **Versatile, low power optical communications**
  - Deep space small satellites
  - Missions with highly constrained SWaP
- **Low mass, volume, power instrument enables demonstration on nanosatellite**
  - 3-6U CubeSat within 5-8 years
- **Heavy student involvement; prepares next generation of space technologists**